

CLAIMS

What is claimed is:

- 1 1. A power converter comprising:
 - 2 a shared first-side stage to receive an input;
 - 3 a plurality of second-side converter stages coupled to the first-side stage,
 - 4 each of second-side converter stages to generate an output; and
 - 5 control circuitry to monitor the outputs of the second-side converter stages
 - 6 and generate a control signal for each output, wherein the control signal turns off
 - 7 switching elements of a corresponding one of the second-side converter stage to
 - 8 regulate the output.
- 1 2. The power converter of claim 1 further comprising:
 - 2 a switching signal generator to generate a switching signal for switching
 - 3 on and off elements of the first-side stage, and switching on and off switching
 - 4 elements of the plurality of second-side converter stages;
 - 5 a plurality of second-side driver circuits, each to provide one of the
 - 6 second-side converter stages with a combined signal corresponding with the
 - 7 switching signal and one of the control signals, the second-side driver circuit
 - 8 turning off switching elements of the second-side stages in response to the one
 - 9 control signal.
- 1 3. The power converter of claim 2 wherein the second-side converter
- 2 stages each comprise a transformer and a set of second-side switching elements
- 3 which are alternatively turned on and off in response to the switching signal from
- 4 a corresponding second-side driver circuit, the second-side switching elements
- 5 being turned off based on the control signal to regulate the output.
- 1 4. The power converter of claim 3 wherein the switching signal has a duty
- 2 cycle of up to 50%, and the combined signal has a duty cycle of less than the
- 3 switching signal depending on the control signal.

1 5. The power converter of claim 2 wherein the first-side stage comprises
2 first and second switching elements which are alternatively switched on and off,
3 and wherein the plurality of second-side stages comprise a first and a second
4 second-side stage, the first second-side stage comprising third and fourth
5 switching elements which are alternatively switched on and off, the second
6 second-side stage comprising fifth and sixth switching elements which are
7 alternatively switched on and off.

1 6. The power converter of claim 5,
2 wherein the switching signal turns on the first, third and fifth switching
3 elements at substantially the same time,
4 wherein the combined signal associated with the first second-side stage
5 turns off the third switching element before the switching signal turns off the first
6 switching element,
7 wherein the combined signal associated with the second second-side stage
8 turns off the fifth switching element before the switching signal turns off the first
9 switching element.

1 7. The power converter of claim 6 further comprising:
2 a first steering diode to inhibit current from flowing from the first to the
3 second second-side stage when the third switching element is turned off before the
4 fifth switching element and while the first switching element is conducting; and
5 a second steering diode to inhibit current from flowing from the second to
6 the first second-side stage when the fifth switching element is turned off before
7 the third switching element and while the first switching element is conducting.

1 8. The power converter of claim 7 further comprising:
2 a freewheeling diode associated with each of the third, fourth, fifth and
3 sixth switching elements to allow transformer inductive leakage current to flow
4 when the associated switching element is turned off.

1 9. The power converter of claim 1 wherein the shared first-side stage is a
2 high side stage to receive an input voltage that is greater than an output voltage,
3 and the plurality of second-side stages are low-side stages.

1 10. The power converter of claim 1 wherein the shared first-side stage is a
2 low-side stage to receive an input voltage that is lower than an output voltage, and
3 the plurality of second side stages are high-side stages.

1 11. A power converter comprising:
2 a single set of high-side switching elements;
3 a plurality of sets of low-side switching elements coupled to the high-side
4 switching elements; and
5 control circuits to turn off the low side switching elements of at least one
6 of the sets before the high side switching elements to regulate an output.

1 12. The power converter of claim 11 further comprising:
2 steering diodes coupling the low-side switching elements with the high-
3 side switching elements, the steering diodes allowing current to flow from the
4 high-side switching elements to the low-side switching elements, the steering
5 diodes inhibiting current from flowing between the sets of low-side switching
6 elements.

1 13. The power converter of claim 12 wherein each switch of the low-side
2 sets has a corresponding one of the steering diodes.

1 14. The power converter of claim 11 further comprising:
2 a freewheeling diode associated with each switch of the low-side sets, the
3 freewheeling diodes allowing leakage current to flow from one of a plurality of
4 transformers when the associated switch it turned off.

1 15. The power converter of claim 11 wherein an input current is split
2 between the sets of low-side switching elements after flowing through one of the
3 high-side switching elements, the split based on output loading of the sets of low-
4 side switching elements.

1 16. The power converter of claim 11 further comprising:
2 a switching signal generator to generate switching signals for the high-side
3 and low-side switching elements;
4 a plurality of low-side control circuits each associated with one of the sets
5 of low-side switching elements, each low-side control circuit to monitor one of a

6 plurality of outputs and to generate a control signal to change a duty-cycle of the
7 low-side switching elements of the associated set.

1 17. The power converter of claim 16 further comprising:
2 a low-side driver circuit for each set of low-side switching elements, the
3 low-side driver circuits to provide switching signals to the low-side switching
4 elements based on the switching signals from the switching signal generator and
5 one of the control signals, wherein low-side driver circuit, based on the control
6 signal from the associated control circuit, changes the duty cycle of the switching
7 signal provided by the low-side driver circuit to the low-side switching elements
8 to regulate an associated output.

1 18. The power converter of claim 17 wherein when a first switch of a first
2 set of low-side switching elements is turned off before a second switch of a
3 second set of low-side switching elements, a steering diode associated with the
4 first switch inhibits current from flowing from a transformer associated with the
5 first set of low-side switching elements to a transformer associated with the
6 second set of low-side switching elements.

1 19. The power converter of claim 17 further comprising an optical coupler
2 to electrically isolate the low-side control circuit from the low-side driver
3 circuitry.

1 20. The power converter of claim 11 further comprising a plurality of
2 transformers, each transformer associated with one of the sets of the low-side
3 switching elements to generate one of a plurality of outputs.

1 21. A method comprising:
2 generating a pulse width modulated switching signal;
3 switching input current through switching elements of a high-side stage in
4 response to the switching signal;

5 switching a first portion of the input current through switching elements of
6 a first low-side stage in response to a first control signal and the switching signal;
7 and

8 monitoring an output of the first low-side stage to generate the first control
9 signal, the first control signal turning off the switching elements of the first low-
10 side stage to regulate the output.

1 22. The method of claim 21 further comprising:

2 switching a second portion of the input current through switching elements
3 of a second low-side stage in response to a second control signal and the switching
4 signal; and

5 monitoring an output of the second low-side stage to generate the second
6 control signal, the second control signal turning off the switching elements of the
7 second low-side stage to regulate the output of the second low-side stage.

1 23. The method of claim 22 further comprising inhibiting current from
2 flowing between the first and second low-side stages when the switching elements
3 of one of the low-side stages is turned off before the other.

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